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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte PAUL A. FARRAR

Appeal 2009-015406
Application 09/259,849
Technology Center 2800

Before, ALLEN R. MACDONALD, DAVID M. KOHUT, and
JASON V. MORGAN, *Administrative Patent Judges*.

KOHUT, *Administrative Patent Judge*.

DECISION ON APPEAL

This is a decision on appeal under 35 U.S.C. § 134(a) of the final rejection of claims 1-7, 12-44, 50-77, and 186-189.¹ We have jurisdiction under 35 U.S.C. § 6(b).

We affirm the Examiner's rejection of these claims.

¹ Claims 8-11 and 78-185 were previously cancelled. The Examiner has indicated that claims 45-49 contain allowable subject matter. Final Rejection 50.

INVENTION

The invention is directed to methods for creating conductive structures in integrated circuits using selective deposition techniques. *See* Abstract. Claim 1 is representative of the invention and is reproduced below:

1. A method of forming a conductor comprising:
depositing an insulator over a planarized surface;
etching a trench having a depth on the insulator;
depositing a barrier layer on the insulator;
depositing a seed layer directly on the barrier layer;
removing the barrier layer and seed layer from selected areas of the insulator, leaving a seed area; and
depositing a conductor on the seed area by a selective deposition process after removing the barrier layer and seed layer from selected areas of the insulator;
wherein the selected areas are directly on a top surface of the insulator.

REFERENCES

Ting	US 5,969,422	Oct. 19, 1999 (filed May 15, 1997)
Brown	US 6,168,704 B1	Jan. 2, 2001 (filed Feb. 4, 1999)
Havemann	US 6,358,849 B1	Mar. 19, 2002 (filed Dec. 21, 1999)

REJECTIONS AT ISSUE

Claims 1-7, 12-17, 19-21, 23-25, 27-32, 34-36, 38-41, 56-77, and 186-189 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Havemann in view of Brown. Final Rejection 2-41.

Claims 42-44 and 50-55 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Havemann in view of Brown and Ting. Final Rejection 41-49.

ISSUES

Claims 1-7, 12-17, 19-21, 23-25, 27-32, 34-36, 38-41, 56-77, and 186-189

Appellant argues on pages 14-23 of the Appeal Brief and pages 2-8 of the Reply Brief that the Examiner's rejection of claims 1-7, 12-17, 19-21, 23-25, 27-32, 34-36, 38-41, 56-77, and 186-189 is in error. These arguments present the following issues:

- a) Did the Examiner err in finding that Havemann in view of Brown discloses selected areas which are directly on a top surface of the insulator?
- b) Did the Examiner err in finding that Havemann in view of Brown discloses depositing a barrier layer to a depth of between fifty and one-thousand angstroms, as disclosed in claim 13?
- c) Did the Examiner err in finding that Havemann in view of Brown discloses depositing gold and silver on the seed area, as disclosed in claims 15 and 19 (respectively)?
- d) Did the Examiner err in finding it obvious to combine Brown with Havemann?

Claims 18, 22, 26, 33, 37, 42-44, and 50-55

Appellant argues on pages 23-25 of the Appeal Brief and pages 8-9 of the Reply Brief that the Examiner's rejection of claims 18, 22, 26, 33, 37, 42-44, and 50-55 is in error. These arguments present the same issue as issue a) above and the additional issue: Did the Examiner err in finding it obvious to combine Brown and Ting with Havemann?

ANALYSIS

Claims 1-7, 12-17, 19-21, 23-25, 27-32, 34-36, 38-41, 56-77, and 186-189

We disagree with Appellant's arguments that the Examiner erred in rejecting the claims listed above. Claim 1 requires that the selected areas of the insulator are located on a top surface of the insulator. Claims 4, 12, 15, 19, 23, 27, 30, 34, 38, 56, 67, and 186 disclose similar limitations that require the "unused areas" or "selected areas" of different layers are located on a top surface of the different layers. Claims 2-3, 5-7, 13-14, 16-17, 20-21, 24-25, 28-29, 31-32, 35-36, 39-41, 57-66, 68-77, and 187-189 are dependent upon one of independent claims 1, 4, 12, 15, 19, 23, 27, 30, 34, 38, 56, 67, and 186. The Examiner finds that Havemann meets this limitation since Havemann discloses a seed layer and a barrier layer that are removed from a top surface of a dielectric or insulator. Ans. 3. Additionally, the Examiner finds that Brown also meets this limitation since Brown discloses a seed layer and a barrier layer that are removed from a top surface of an insulating layer. Ans. 4. Appellant argues that, in both of the references, the seed layer and barrier layer do not directly touch the insulator

before they are removed.² App. Br. 15. We agree with Appellant's interpretation of the references, but we disagree that they do not disclose that which is claimed.

The claims require that the "selected areas" or "unused areas" are directly "on a top surface" of the different layers. The Examiner interprets this to mean that the "areas" are located above the different claimed layers, even though the "areas" are not "directly disposed" on the different layers. Ans. 3.³ Additionally, Appellant's Specification does not preclude the Examiner from interpreting the claim limitations in this manner. Thus, we find the Examiner's interpretation to be reasonable. As a result, it does not matter if before the areas are selected that there is a silicon oxynitride antireflection layer (Havemann, Fig. 1h) or patterned photomask (Brown, Fig. 4A) between the insulator layer and the seed and barrier layers since both are above the insulator layer. Therefore, we agree with the Examiner that both Havemann and Brown disclose selected areas that are directly on a top surface of the different layers.

Appellant also argues that it would not have been obvious to combine Brown with Havemann because the motivation provided by the Examiner is

² Appellant argues that the Examiner, on page 3 of the Answer, indicates that reference numeral 122 of Havemann discloses a conductive layer and not an insulator layer. Reply Br. 2. However, when reviewing the Havemann reference at the cited locations, it is clear that reference numeral 122 is a deposit dielectric, i.e., an insulator. *See* Havemann, col. 3, l. 15.

³ We further note that the claimed "depositing a conductor on the seed area by a selective deposition process after removing the barrier layer and seed layer from selected areas of the insulator" and "wherein the selected areas are directly on a top surface of the insulator" merely require that the "selected areas" (an artificial construct) be viewed as being directly on the top surface. This language is not equivalent to requiring that the claimed "conductor" also be "directly on a top surface of the insulator."

not supported by the record. App. Br. 20; Reply Br. 7. Specifically, Appellant contends that the motivation used by the Examiner to combine the references only applies to the deposition of copper on desired areas and not to the removal of barrier and seed layers. App. Br. 20; Reply Br. 7. As noted above, the Examiner finds that both Havemann and Brown disclose removing barrier and seed layers from selected areas. Ans. 3-4. The Examiner is simply showing that the references are from the same field of endeavor. The Examiner uses Brown to show that selectively depositing a conductor is well known (Ans. 6) and the reason for using this process versus a blanket deposition process is to reduce costs and waste. Ans. 6. (citing Brown, col. 16, ll. 42-60). Thus, the Examiner's motivation is reasonable. Even so, the Supreme Court stated that an explicitly stated motivation to combine the references is seen as "helpful insight," *KSR*, 550 U.S. at 418, but that the combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results. *Id.* at 416. In this situation, the Examiner finds that Havemann discloses a method of forming a conductor wherein a barrier layer is deposited on an insulator and a seed layer is deposited on the barrier layer. Final Rejection 2. The Examiner finds that Brown discloses a method wherein the barrier layer and the seed layer are removed from selected areas of a top surface of the insulator and a conductor is subsequently selectively deposited on the seed area. Final Rejection 3. As a result, the combination of Brown with Havemann yields the predictable result of creating a conductor wherein the barrier and seed layers are removed from particular areas and a conductor is selectively deposited on the seed area. Thus, we

agree with the Examiner that it would have been obvious to combine Brown with Havemann.

With respect to claim 13, Appellant argues that neither Havemann nor Brown disclose a trench with a depth between fifty and 1000 angstroms. App. Br. 19; Reply Br. 4. Appellant argues that the Examiner's finding that Brown discloses this limitation (Final Rejection 7-8) is based solely on the Examiner's personal knowledge and there is no evidence to support a finding that it would have been obvious to create a depth of such a measurement. App. Br. 19; Reply Br. 4-5. We disagree with Appellant since the Examiner's finding that the trench depth is at least 200 angstroms is supported by Havemann at column 3, ll. 49-55 wherein the passivation layer, which fills the trench, is between 10 and 20 nm.

With respect to claims 15 and 19, Appellant argues that the references teach away from the use of gold and/or silver as a material deposited on the seed layer, as required by the claims. App. Br. 19; Reply Br. 5-6. Appellant again argues that the Examiner's finding that Brown discloses the use of several different metals including gold and silver (Final Rejection 8-14; Ans. 5-6) is based solely on the Examiner's personal knowledge. App. Br. 19-20. Additionally, Appellant argues that the portion of the Brown reference cited by the Examiner actually teaches away from the use of these materials for various reasons. Reply Br. 5-6. We disagree. Brown, in column 1, lines 21-46, acknowledges that the different metals each have different advantages and disadvantages to their use in a semiconductor deposition process. In fact, Brown, recognizes that even copper has its own disadvantages. Col. 1, ll. 38-41. While copper is Brown's chosen metal (Abstract), one of ordinary

skill in the art could and would use any of the disclosed metals, i.e., copper, silver, gold, etc., depending on the desired specifications.

Appellant makes additional arguments in the Reply Brief that neither reference discloses “depositing a barrier layer on the insulator.” Reply Br. 2. We find these arguments to be belated and thus entitled to no consideration. *See Ex parte Borden*, 93 USPQ2d 1473, 1473-74 (BPAI 2010)

(“informative”) (absent a showing of good cause, the Board is not required to address an argument newly presented in the Reply Brief that could have been presented in the principal Brief on Appeal). Therefore, for the reasons stated *supra*, we sustain the Examiner’s rejection of claims 1-7, 12-17, 19-21, 23-25, 27-32, 34-36, 38-41, 56-77, and 186-189.

Claims 18, 22, 26, 33, 37, 42-44, and 50-55

Since we agree with the Examiner’s findings with respect to claims 1-7, 12-17, 19-21, 23-25, 27-32, 34-36, 38-41, 56-77, and 186-189, we also agree with the Examiner’s similar findings with respect to claims 18, 22, 26, 33, 37, 42-44, and 50-55. In addition, Appellant argues that it would not have been obvious to combine Ting with Havemann and Brown since no additional motivation has been provided for the combination. App. Br. 20; Reply Br. 8. As noted above, an explicitly stated motivation to combine the references is seen as “helpful insight,” *KSR*, 550 U.S. at 418, but the combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results. *Id.* at 416. As Ting is used to disclose the use and deposition of different metals while fabricating a semiconductor device (Ans. 7), we agree that the combination of these materials and processes with Havemann and Brown do nothing more than yield a semiconductor device that is created by the cited

deposition processes with the cited metals. Thus, we agree with the Examiner's finding that it would have been obvious to combine Ting with Havemann and Brown and we sustain the Examiner's rejection of claims 18, 22, 26, 33, 37, 42-44, and 50-55.

CONCLUSION

The Examiner did not err in finding that Havemann in view of Brown discloses selected areas which are directly on a top surface of the insulator.

The Examiner did not err in finding that Havemann in view of Brown discloses depositing a barrier layer to a depth of between fifty and one-thousand angstroms, as disclosed in claim 13.

The Examiner did not err in finding that Havemann in view of Brown discloses depositing gold and silver on the seed area, as disclosed in claims 15 and 19 (respectively).

The Examiner did not err in finding it obvious to combine Brown with Havemann.

The Examiner did not err in finding it obvious to combine Brown and Ting with Havemann.

SUMMARY

The Examiner's decision to reject claims 1-7, 12-44, 50-77, and 186-189 is affirmed.

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No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136 (a)(1)(iv).

AFFIRMED

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